

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

PLC Course

مقرر الحاكومات المنطقية البرمجة

Lec 6

5/4/2016

PLC Timers
(Part 2)
(Retentive Timers)

Report

- For the two ladder diagrams shown in Fig.1 and Fig.2, using timing diagram, illustrate the states of CR, T1, T2, M1 and M2 for the states of input switches Start, Stop, LS1 and LS2 that shown in Fig.3

Fig.1
Case:1

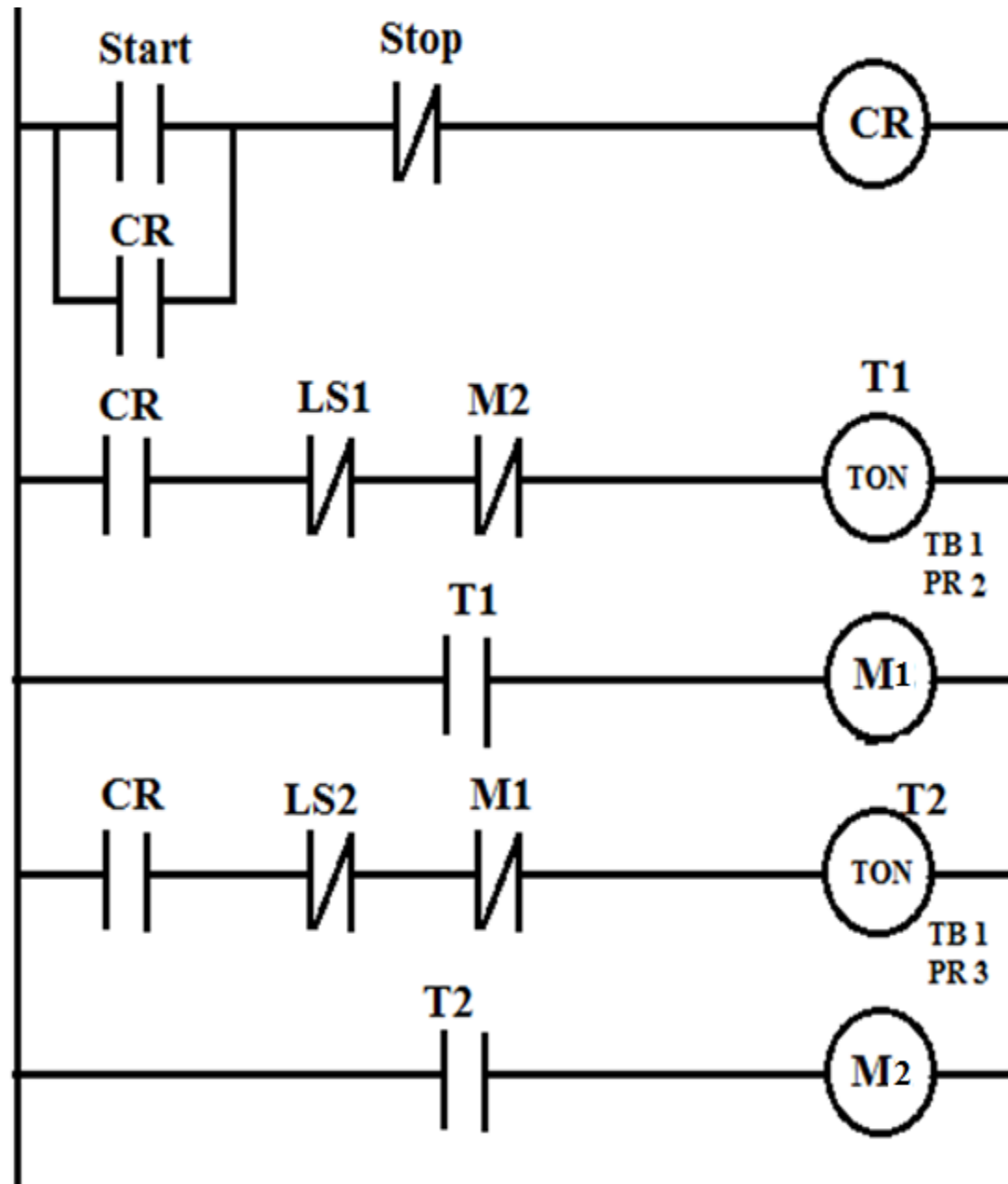


Fig.2
Case:2

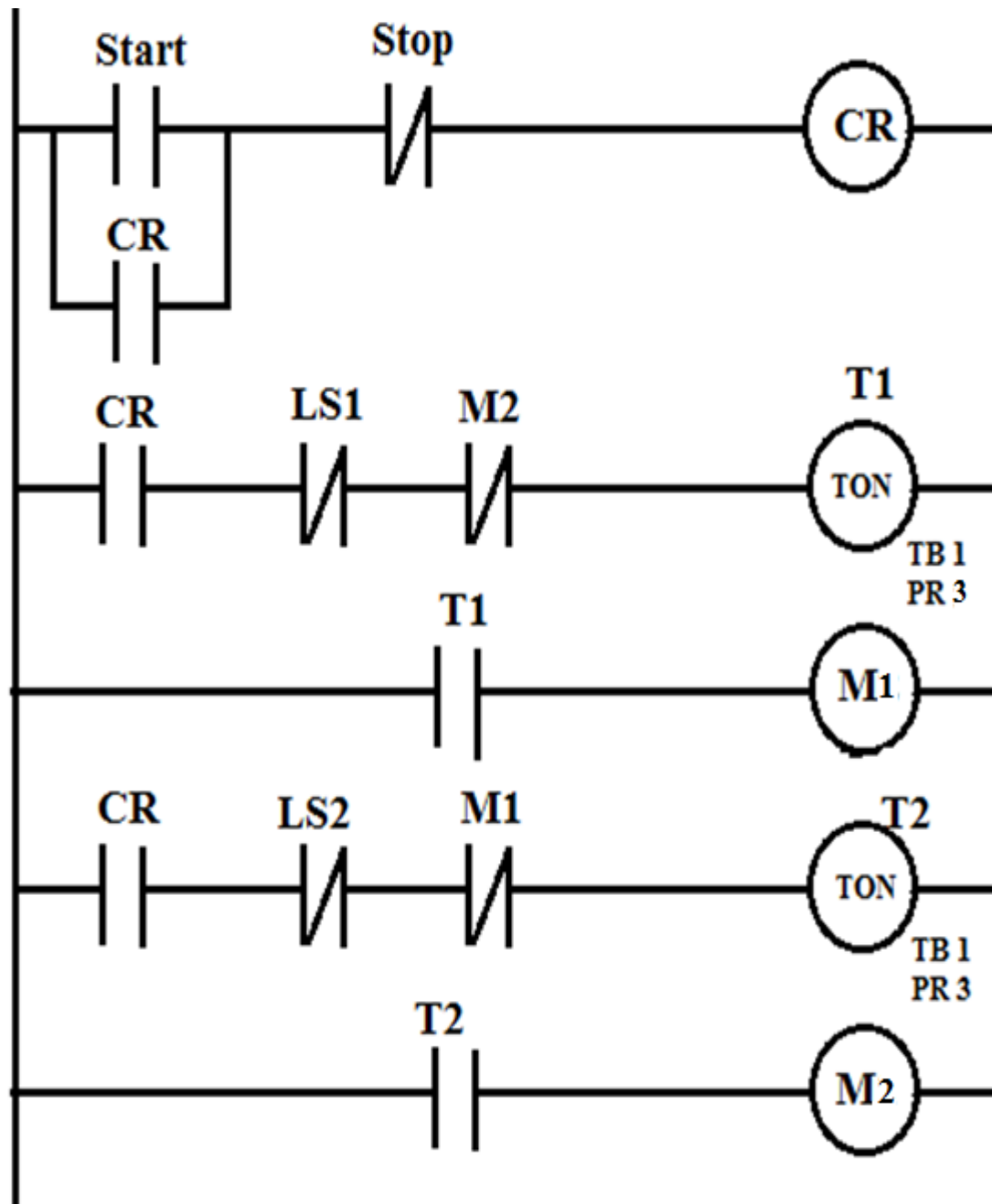
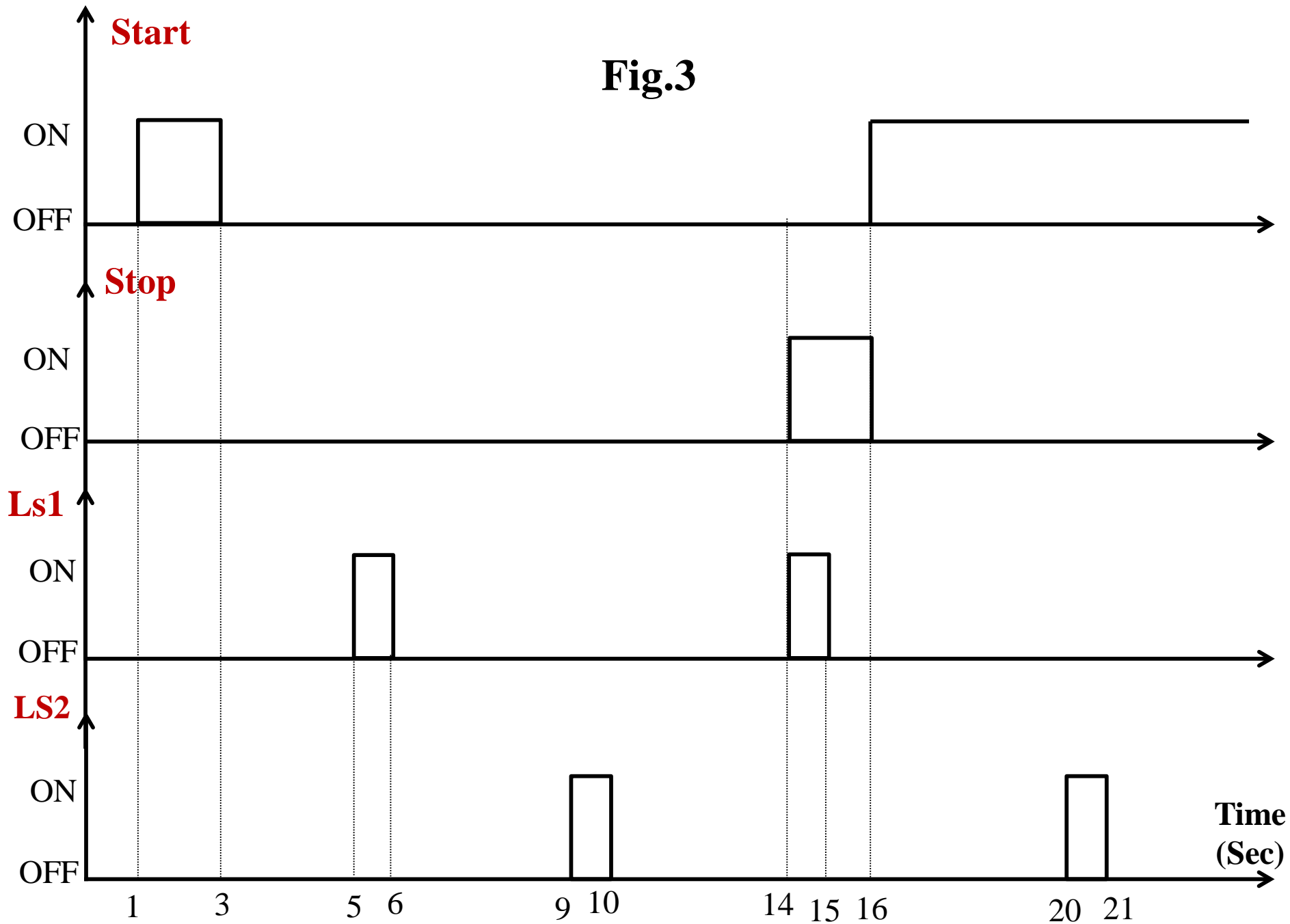
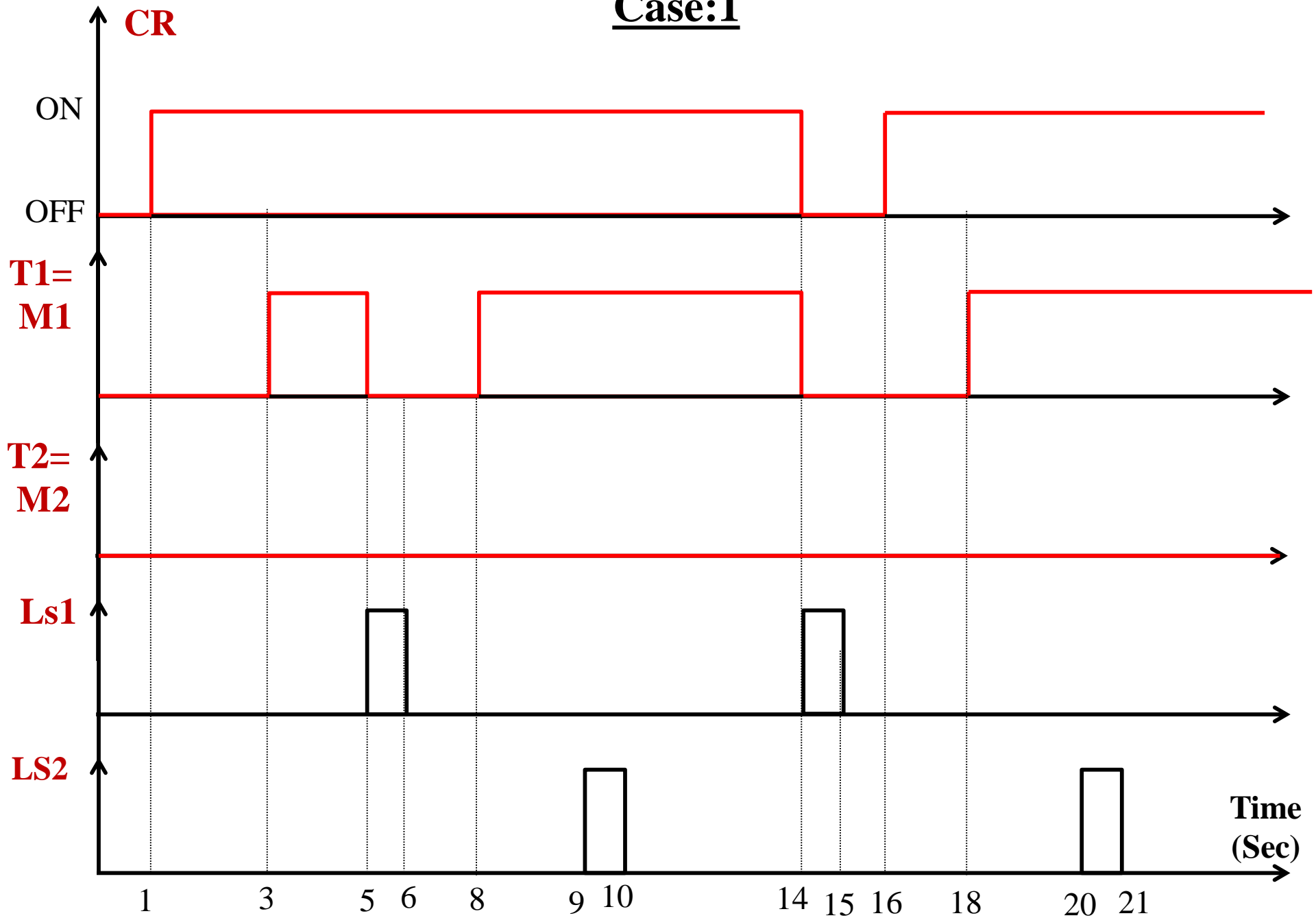


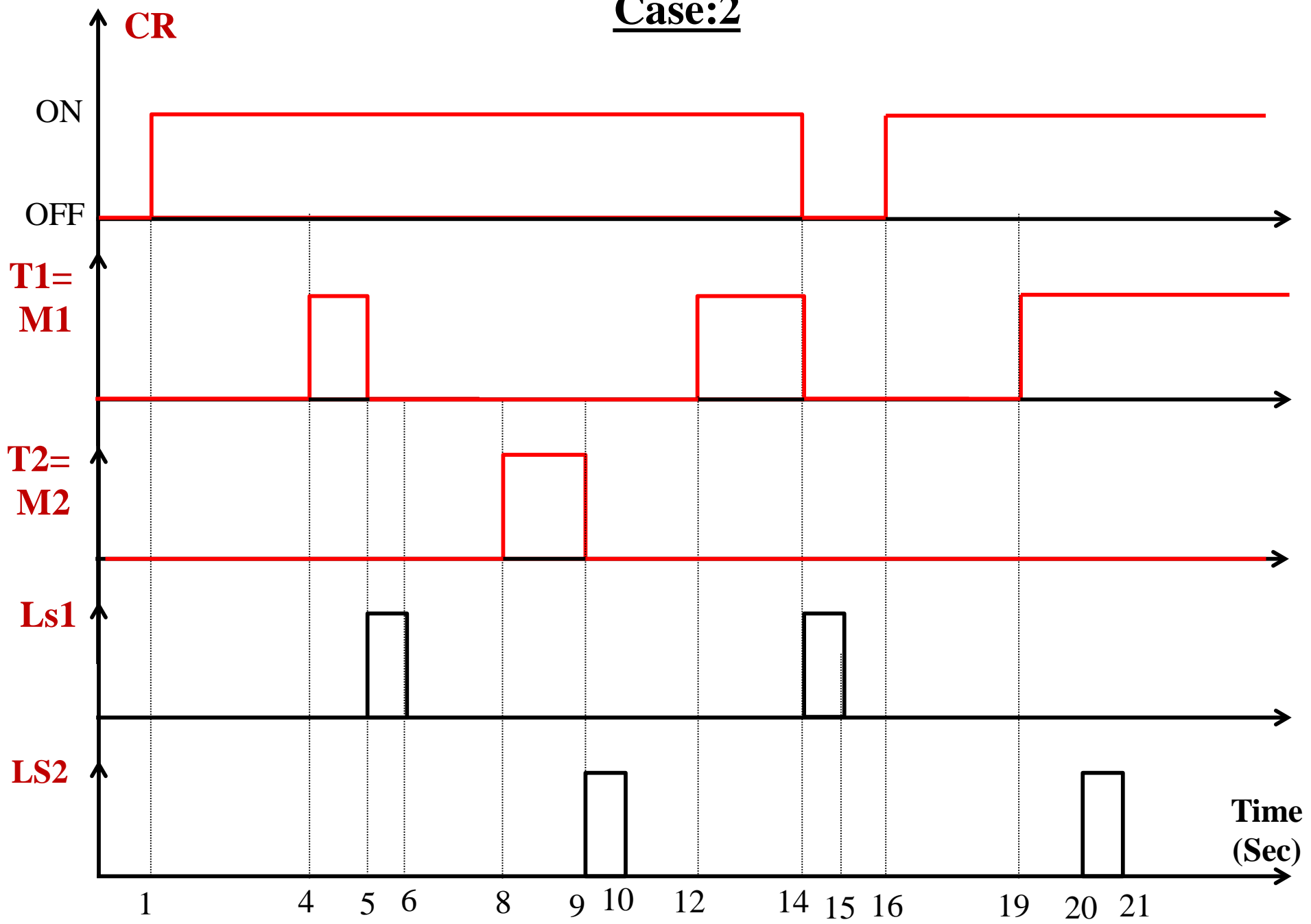
Fig.3



Case:1



Case:2



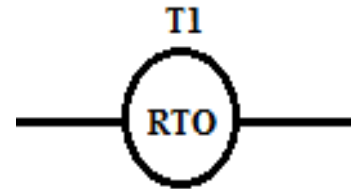
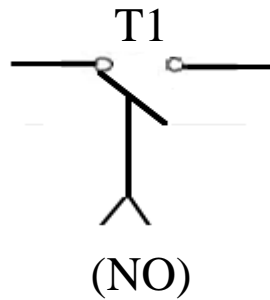
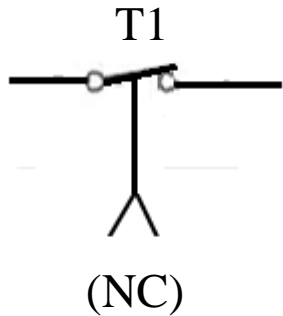
Retentive Timers (Retentive ON-Delay Timer)

RTO

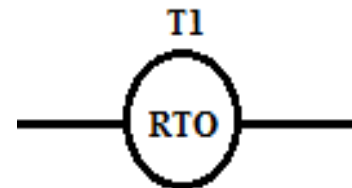
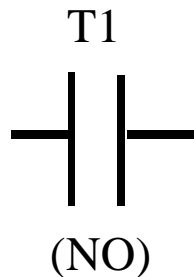
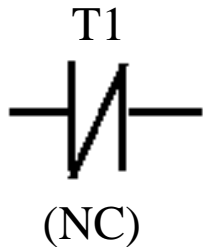
- Retentive ON-Delay Timer (**RTO**) or retentive timer is used when you want to retain the accumulated time (AT) values even if the timer is de-energized (the rung state of the timer is changed from true to false).
- The accumulated time (AT) of **RTO** does not reset to 0 when the timer is de-energized.
- To reset the accumulated value of the timer to 0, use a reset (RES) instruction in another rung with the same address as the RTO.

Retentive ON-Delay Timer (RTO)

- Symbols used in relay logic ladder diagram:

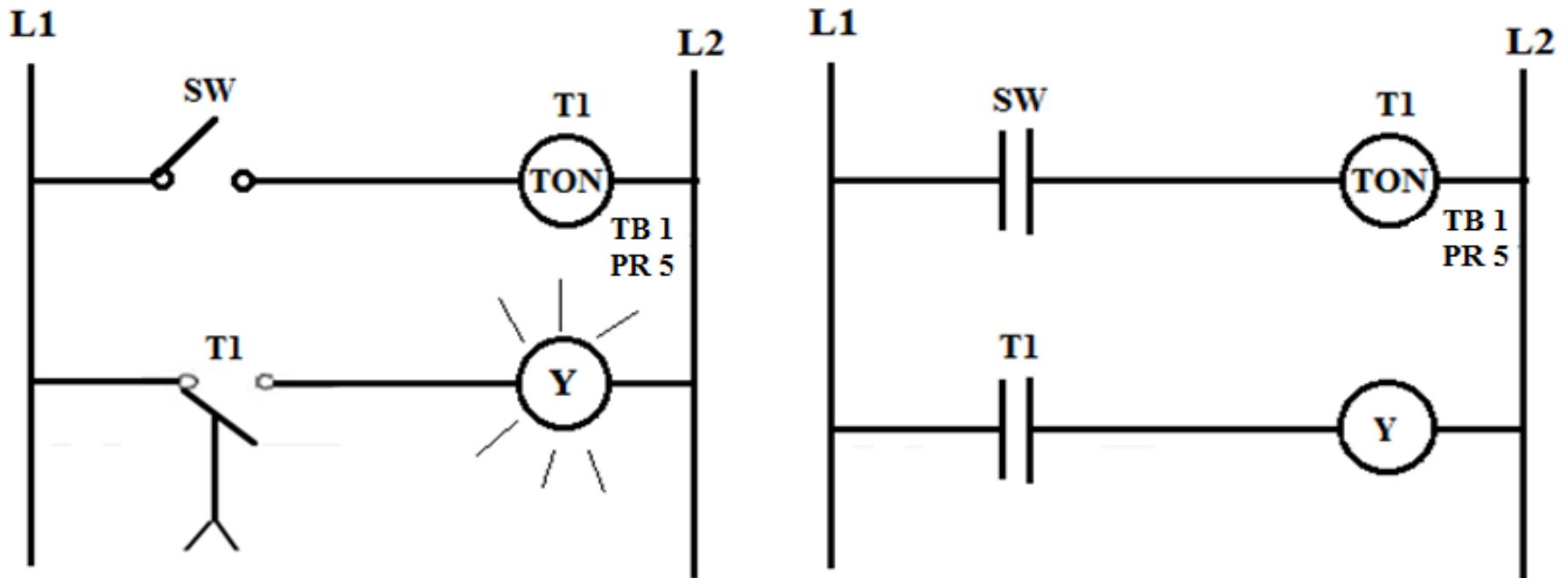


- Symbols used in ladder diagram:

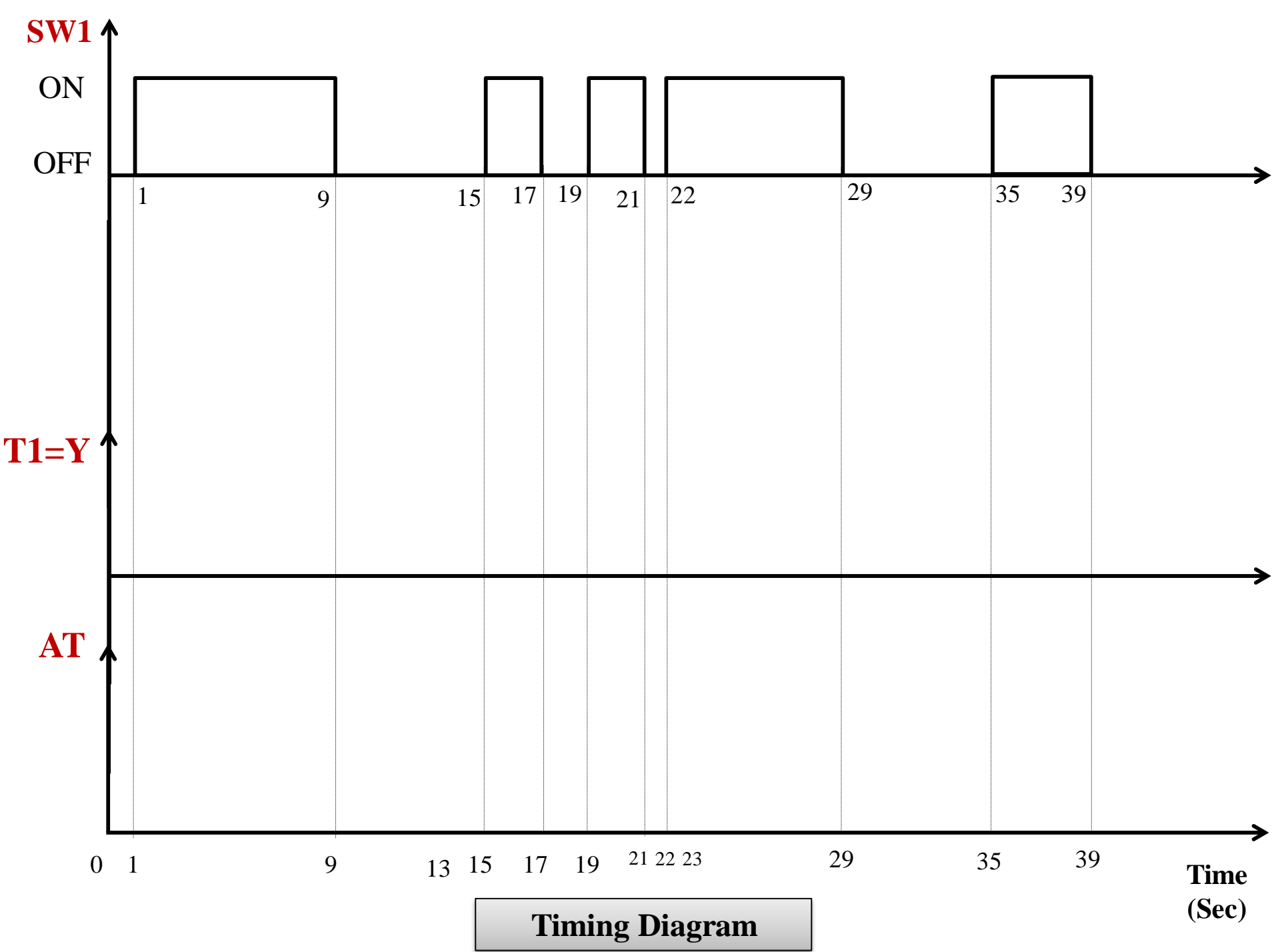


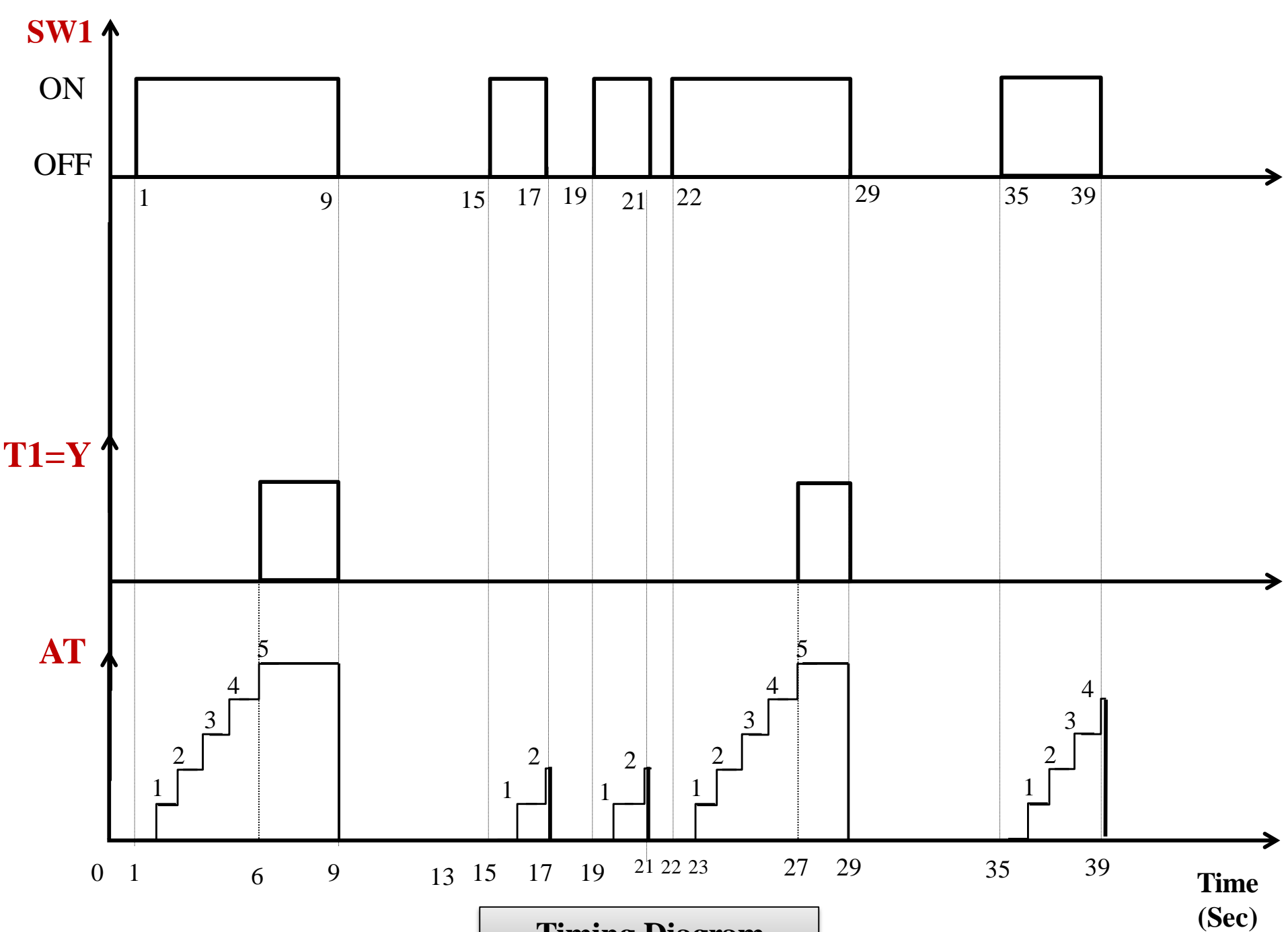
EX1: TON

- For the following diagram:



- Using timing diagram, illustrate the states of T1, AT and Y

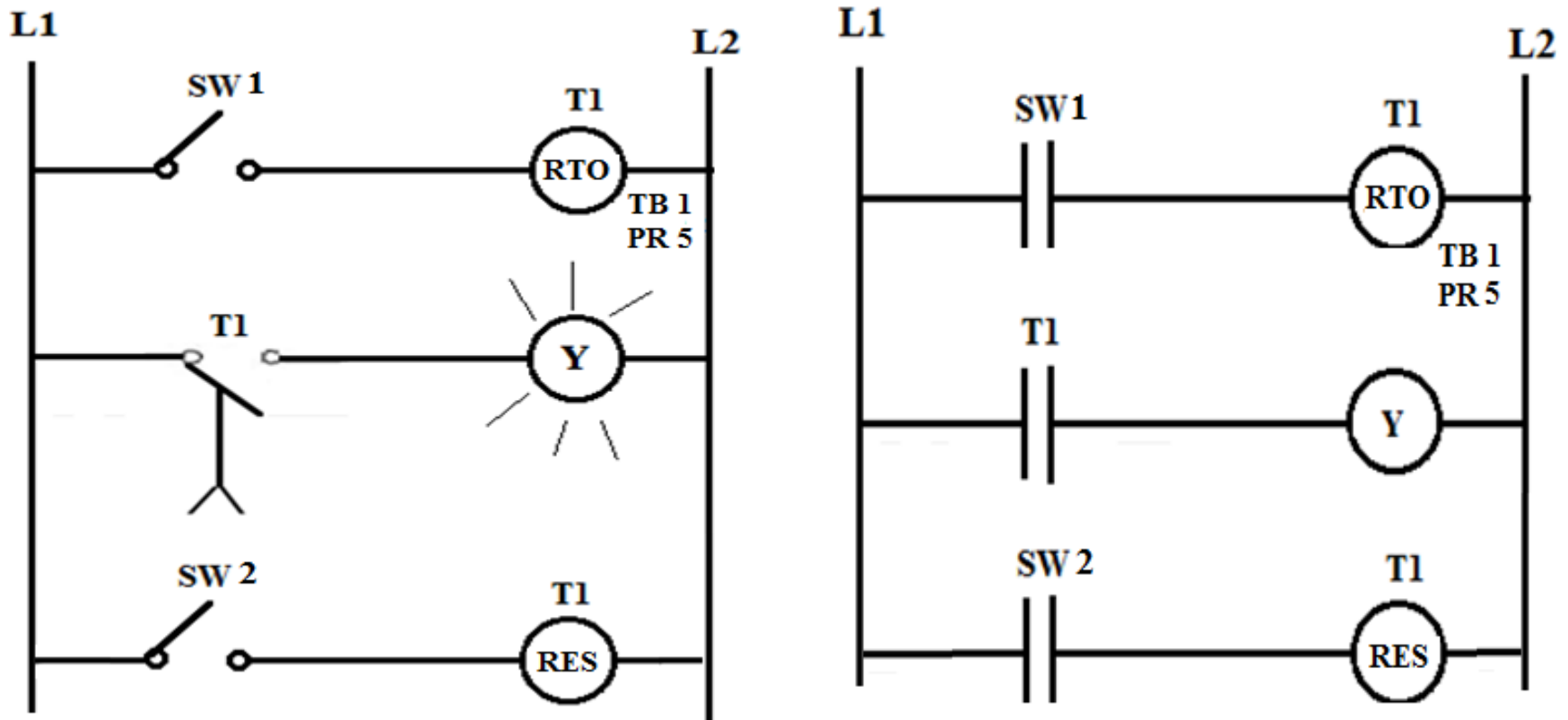




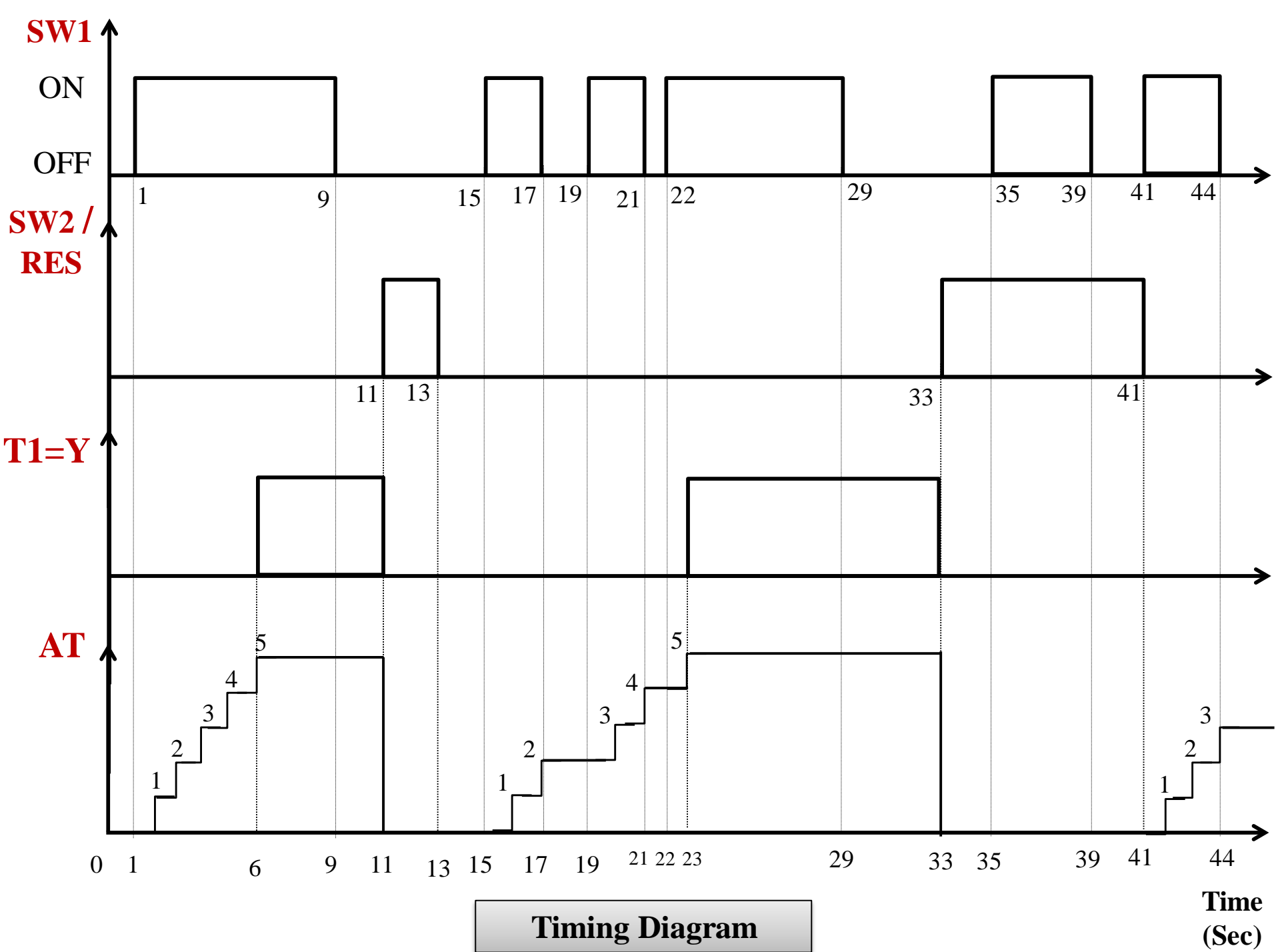
Timing Diagram

EX2: RTO

- For the following diagram:

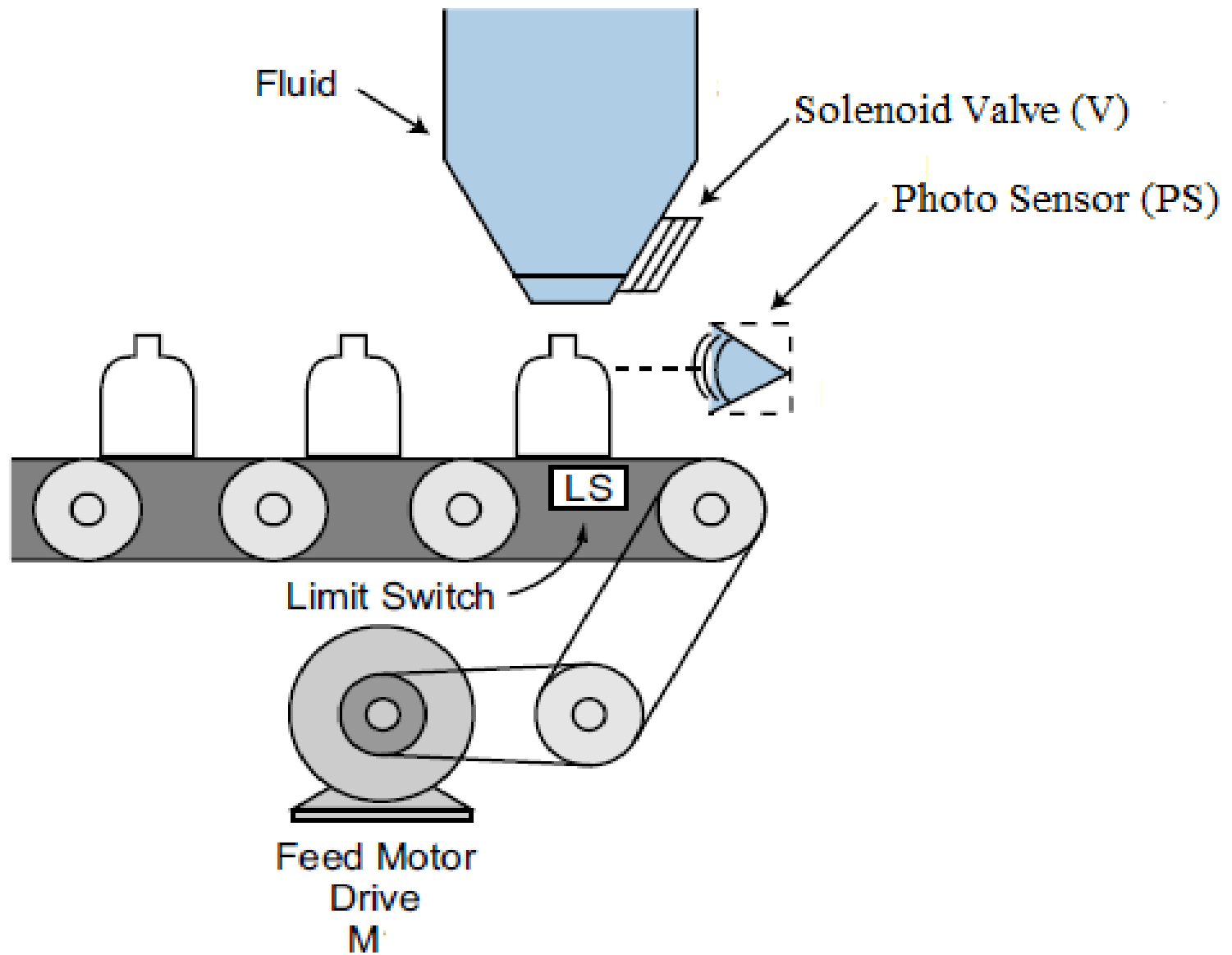


- Using timing diagram, illustrate the states of T1, AT and Y



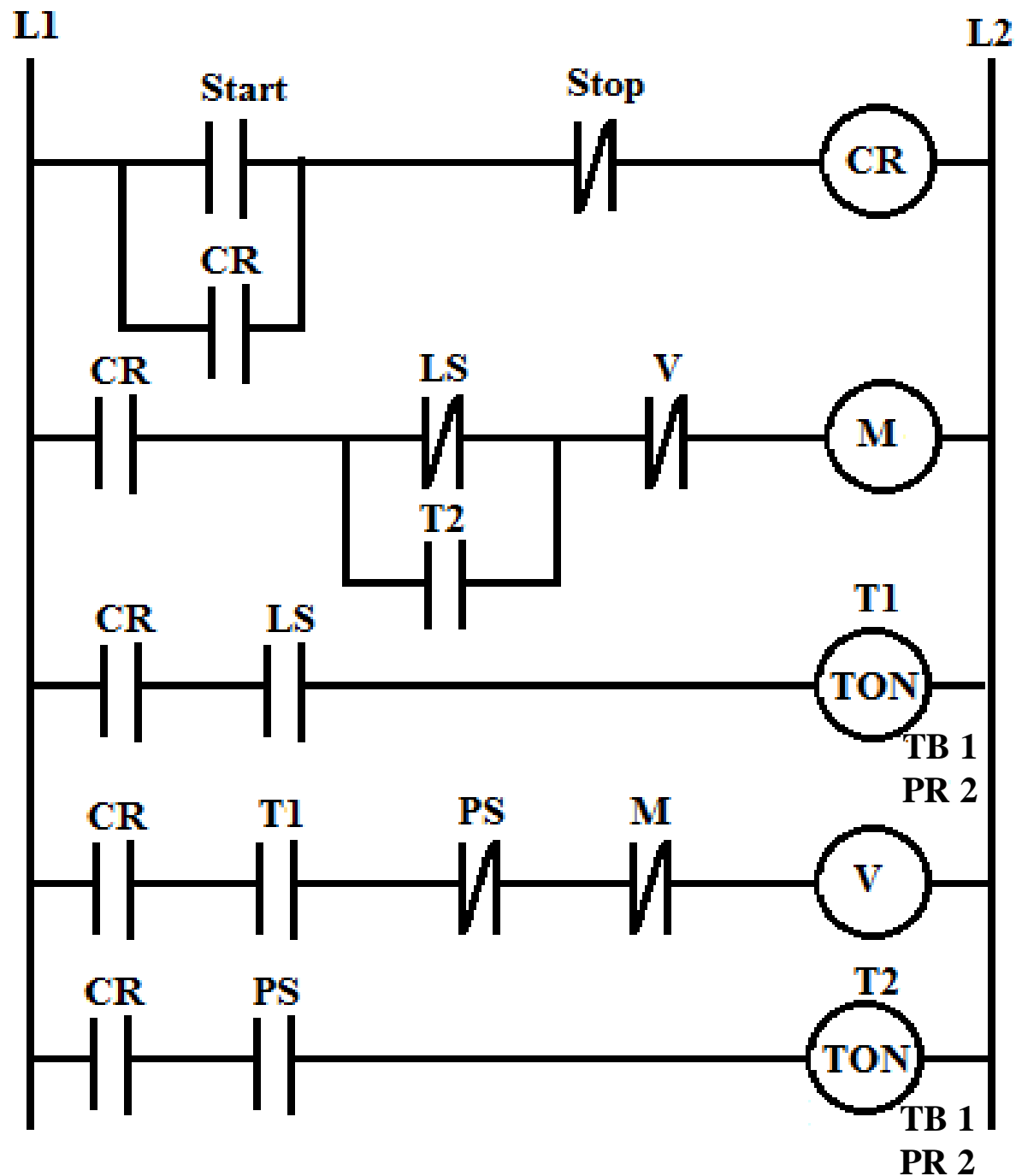
EX3: Production Line

- Write a ladder diagram program for a production line that detects the position of a bottle via a limit switch (**LS**), then, waits **2 sec** and opens the valve (**V**) to fill the bottle until a photo-sensor (**PS**) detects a filled condition.
- After the bottle is filled, waits **2 sec**, the motor moves again and to repeat these operation to the next bottle and son.
- The production line should include start and stop push button switches.



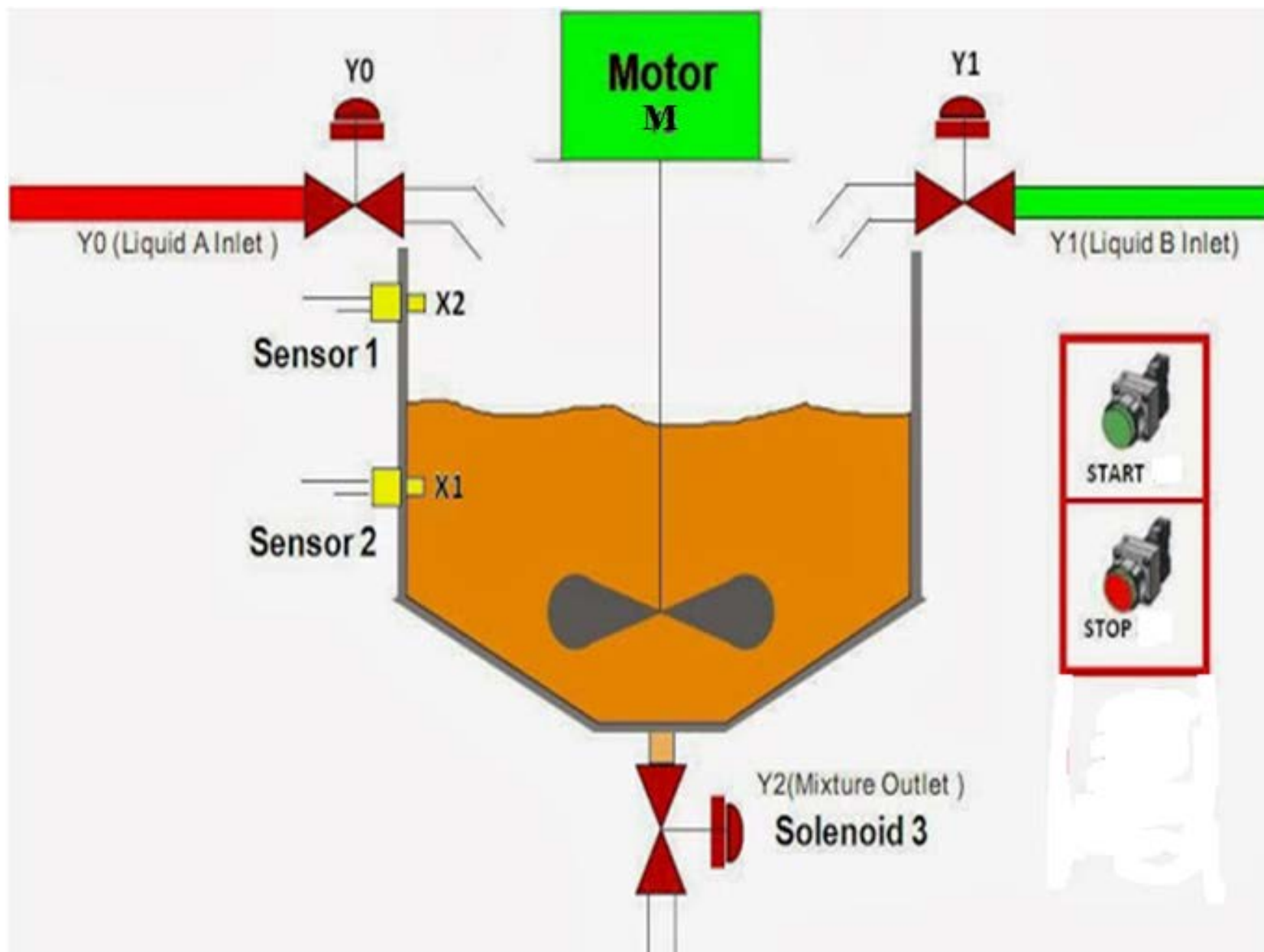
- We need the following inputs and outputs :

Label	I/O
Start (NO Push button switch)	Inputs
Stop (NC Push button switch)	
LS	
PS	
M (Motor)	Outputs
V (Valve)	
CR	Internal relay / Internal output
T1 (2 sec TON)	Timers
T2 (2 sec TON)	



EX4: Liquid Filling and Mixing

- In this application, automatically filling the container with liquids A and B in order when Start is pressed. When it reaches the set level, mixes the two liquids evenly then open the valve to let out the mixture. These processes are sequentially done as in the following:
 - 1) When Start is pressed, at the first, the valve (Y0) opens to fill the container with liquid A until it reaches to level x1(via limit switch).
 - 2) Then the valve (Y1) opens to fill the container with liquid B until it reaches to level x2(via limit switch).
 - 3) The motor (M) starts the mixing process and this process takes 30 Sec.
 - 4) The valve (Y2) opens to drain out the mixture of the container and this process takes 60 Sec.
 - 5) Steps 1-4 are repeated until Stop is pressed.



Label	I/O
Start (NO Push button switch)	Inputs
Stop (NC Push button switch)	
X1 (limit switch)	
X2 (limit switch)	
Y0 (solenoid valve of liquid A)	Outputs
Y1 (solenoid valve of liquid B)	
Y2 (solenoid valve of mixture outlet)	
M (Mixture Motor)	
CR	Internal relay / Internal output
T1 (30 sec TON)	Timers
T2 (60 sec TON)	

